AzMERIT | Arizona's Statewide Achievement Assessment for English Language Arts and Mathematics

Math Item Specifications

HIGH SCHOOL (GEOMETRY)

Arizona Department of Education with American Institutes for Research - 2016

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Introduction

The Arizona Statewide Achievement Assessment for English Language Arts and Mathematics (AzMERIT) is Arizona's statewide achievement test. AzMERIT assesses the Arizona College and Career Ready Standards (AzCCRS) adopted by the Arizona State Board of Education in 2010. AzMERIT will inform students, teachers, and parents about preparedness for college and careers upon graduating from high school. AzMERIT tests are computer-based, meaning that they can better assess students' critical thinking skills and provide them with opportunities to demonstrate a deeper understanding of the materials. Computer-based testing also allows for the use of a variety of innovative items types.

During the item-development process, all AzMERIT items are written in accordance with the Item Specifications and are reviewed and approved by a committee of Arizona educators to confirm alignment and appropriateness for inclusion in the test. AzMERIT items are generally representative of Arizona's geographic regions and culturally diverse population. Items are reviewed for the following kinds of bias: gender, racial, ethnic, linguistic, religious, geographic, and socioeconomic. Item reviews also include consideration of issues related to individuals with disabilities. Arizona community members also have an opportunity to review items for issues of potential concern to members of the community at large. Reviewers are asked to consider the variety of cultural, regional, philosophical, political, and religious backgrounds throughout Arizona, and then to determine whether the subject matter will be acceptable to Arizona students, families, and other members of Arizona communities.

This *AzMERIT Item Specifications* is a resource document that defines the content and format of the test and test items for item writers and reviewers. Each *Item Specifications* document indicates the alignment of items with the AzCCRS. It also serves to provide all stakeholders with information about the scope and function of assessment items. This document can also serve to assist educators to understand how assessment items are developed in alignment with the standards for English language arts and math. These item specifications for AzMERIT are intended to provide information regarding standards, item formats and response types. The descriptions of math practices, blueprints, and depth of knowledge in this document are meant to provide an overview of the test. Item specifications are meant for the purposes of assessment, not instruction. They are not intended to be tools for instruction or the basis for curricula. AzMERIT has a test blueprint that was developed by Arizona and is different from any other state or consortium test blueprint.

For the math portion of AzMERIT, all of the test questions are aligned to the mathematic content standards for these subject areas. Similarly, each item assesses a single domain and aligns to one or more of the eight Math Practices. Any item specifications that are absent for standards listed in this document may be under development. This document does not endorse the exclusion of the instruction of any grade-level content standards. The test will ask questions that check a student's conceptual understanding of math as well as their procedural skills. These items have been written to be free from bias and sensitivity, and widely vary in their degree of difficulty.

Item Development Process

AzMERIT items go through a rigorous review before they are operational. When an item is "operational" it means it is used to determine a student's score on the assessment. This is a description of the process every item must go through before it is operational on AzMERIT.

Sample tests are available online for the math portion of AzMERIT. For more information view the Guide to the Sample Tests at http://azmeritportal.org/.

Test Construction Guidelines

The construction of the AzMERIT assessment is guided by the depth and rigor of the Arizona College and Career Ready Standards. Items are created to address key components of the standards and assess a range of important skills. The AzMERIT Blueprint provides an overview of the distribution of items on the AzMERIT according to the standards. The standards for Math Practices are embedded within all AzMERIT items. Further, the AzMERIT blueprint outlines the Depth of Knowledge distribution of items.

Math Practices

The standards for Mathematical Practice highlight the knowledge, skills and abilities that should be developed in students at all grades. The Mathematical Practices are a part of each course description for Grades 3 through 8, Algebra I, Geometry, and Algebra 2. These practices are a vital part of the curriculum. These skills are often difficult to measure, and as a result, every item created for AzMERIT aligns to one or more of the following eight Mathematical Practices.

Math Practice (MP)	Description
Math Practice 1	**Make sense of problems and persevere in solving them.** Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Math Practice (MP)	Description
Math Practice 2	**Reason abstractly and quantitatively**. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
Math Practice 3	**Construct viable arguments and critique the reasoning of others.** Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Math Practice (MP)	Description
Math Practice 4	**Model with mathematics.** Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
Math Practice 5	**Use appropriate tools strategically.** Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Math Practice (MP)	Description
Math Practice 6	**Attend to precision.** Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.
Math Practice 7	**Look for and make use of structure.** Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well-remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 – 3(x – y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
Math Practice 8	**Look for and express regularity in repeated reasoning.** Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y – 2)/(x – 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)(x^2 + x + 1)$, and $(x – 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Blueprint

The AzMERIT blueprints detail specific information in regard to the domains tested at each grade level. The blueprint outlines the percentage of points aligned to each domain.

	Domain	Minimum	Maximum
Algebra 1	Algebra	40%	44%
	Functions	36%	40%
	Statistics	17%	21%

Approximately 70% of the assessment for High School will be on major content.

	Domain	Minimum	Maximum
Geometry	Congruence	23%	27%
	Similarity, Right Triangles, And Trigonometry	27%	31%
	Circles, Geometric Measurement and Dimensions	23%	27%
	Modeling with Geometry	17%	21%

Approximately 70% of the assessment for High School will be on major content.

	Domain	Minimum	Maximum
Algebra 2	Algebra	34%	38%
	Functions	32%	36%
	Statistics	27%	31%

Approximately 70% of the assessment for High School will be on major content.

Depth of Knowledge (DOK)

DOK refers to the level of rigor or sophistication of the task in a given item, designed to reflect the complexity of the AzCCRS. Items at DOK level 1 focus on the recall of information, such as definitions, terms, and simple procedures. Items at DOK 2 require students to make decisions, solve problems, or recognize patterns; in general, they require a greater degree of engagement and cognitive processing than items at DOK 1. Items at DOK 3 feature higher-order cognitive tasks that assess students' capacities to approach abstract or complex problems.

Percentage of Points by Depth of Knowledge (DOK) Level			
High School	DOK Level 1	DOK Level 2	DOK Level 3
	10% - 20%	60% - 70%	12% - 30%

For more information on DOK go to www.azed.gov/AzMERIT.

Calculators

Calculators are permitted for both the paper-based and computer-based assessment for High School Math.

Item Formats

The AzMERIT Assessments are composed of item formats that include traditional multiple-choice response items and technology-enhanced response items (TEI). TEIs are computer-delivered response items that require students to interact with test content to select, construct, and/or support their responses. TEIs are better able to assess a deeper level of understanding.

Currently, there are nine types of TEIs that may appear on the High School Math computer based assessment for AzMERIT:

- Editing Tasks (ET)
- Editing Task Choice (ETC)
- Equation Editor (EQ)
- Graphic Response Item Display (GRID)
- Hot Text (HT)
    - Selectable Hot Text
    - Drag-and-Drop Hot Text
- Matching Item (MI)
- Multi-Select (MS)
- Open Response
- Table Item (TI)

For paper based assessments (including those for students with an IEP or 504 plan that specifies a paper based accommodation), TEIs will be modified so that they can be scanned and scored electronically or hand-scored.

See the table below for a description of each TEI. In addition, for examples of each response item format described, see the AzMERIT Training Tests at http://azmeritportal.org/.

Item Format	Description
Editing Task (ET)	The student clicks on a highlighted word or phrase that may be incorrect, which reveals a text box. The directions in the text box direct the student to replace the highlighted word or phrase with the correct word or phrase. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.
Editing Task Choice (ETC)	The student clicks a highlighted word or phrase, which reveals a drop-down menu containing options for correcting an error as well as the highlighted word or phrase as it is shown in the sentence to indicate that no correction is needed. The student then selects the correct word or phrase from the drop-down menu. For paper-based assessments, the item is modified so that it can be scanned and scored electronically. The student fills in a circle to indicate the correct word or phrase.

Item Format	Description
Equation Editor (EQ)	The student is presented with a toolbar that includes a variety of mathematical symbols that can be used to create a response. Responses may be in the form of a number, variable, expression, or equation, as appropriate to the test item. For paper-based assessments, this item type may be replaced with a modified version of the item that can be scanned and scored electronically or replaced with another item type that assesses the same standard and can be scanned and scored electronically.
Graphic Response Item Display (GRID)	The student selects numbers, words, phrases, or images and uses the drag-and-drop feature to place them into a graphic. This item type may also require the student to use the point, line, or arrow tools to create a response on a graph. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.
Hot Text (HT)	**Selectable Hot Text -** Excerpted sentences from the text are presented in this item type. When the student hovers over certain words, phrases, or sentences, the options highlight. This indicates that the text is selectable ("hot"). The student can then click on an option to select it. For paper- based assessments, a "selectable" hot text item is modified so that it can be scanned and scored electronically. In this version, the student fills in a circle to indicate a selection.
	Drag-and-Drop Hot Text - Certain numbers, words, phrases, or sentences may be designated "draggable" in this item type. When the student hovers over these areas, the text highlights. The student can then click on the option, hold down the mouse button, and drag it to a graphic or other format. For paper-based assessments, drag-and-drop hot text items will be replaced with another item type that assesses the same standard and can be scanned and scored electronically.
Matching Item (MI)	The student checks a box to indicate if information from a column header matches information from a row. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.
Multi-Select (MS)	The student is directed to select all of the correct answers from among a number of options. These items are different from multiple-choice items, which allow the student to select only one correct answer. These items appear in the online and paper-based assessments.
Open Response	The student uses the keyboard to enter a response into a text field. These items can usually be answered in a sentence or two. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.

Item Format	Description
Table Item (TI)	The student types numeric values into a given table. The student may complete the entire table or portions of the table depending on what is being asked. For paper-based assessments, this item type may be replaced with another item type that assesses the same standard and can be scanned and scored electronically.

Arizona's College and Career Ready Standards (AzCCRS)

Geometry

Circles (G-C)

HS.G-C.A – Understand and apply theorems about circles.

HS.G-C.B – Find arc lengths and areas of sectors of circles.

Congruence (G-CO)

HS.G-CO.A – Experiment with transformations in the plane.

HS.G-CO.B – Understand congruence in terms of rigid motions.

HS.G-CO.C – Prove geometric theorems.

HS.G-CO.D – Make geometric constructions.

Geometric Measurement and Dimensions (G-GMD)

HS.G-GMD.A – Explain volume formulas and use them to solve problems.

HS.G-GMD.B – Visualize relationships between two-dimensional and three-dimensional objects.

Expressing Geometric Properties with Equations (G-GPE)

HS.G-GPE.A –Translate between the geometric description and the equation for a conic section.

HS.G-GPE.B – Use coordinates to prove simple geometric theorems algebraically.

Modeling with Geometry (G-MG)

HS.G-MG.A – Apply geometric concepts in modeling situations.

Similarity, Right Triangles, and Trigonometry (G-SRT)

HS.G-SRT.A – Understand similarity in terms of similarity transformations.

HS.G-SRT.B – Prove theorems involving similarity.

HS.G-SRT.C – Define trigonometric ratios and solve problems involving right triangles.

HS.G-SRT.D – Apply trigonometry to general triangles.

High School Math Item Specifications (Geometry)

Standards for Circles

Content Standards	AzCCRS.Math.Content.G-C.A.1 Prove that all circles are similar.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. Aside from items that ask the student to find the ratio of dilation between circles, items should focus on the fact that any circle can be obtained by a translation and dilation of any other circle - thus, they are similar (this is related to many of the		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	3, 5

Sample Task Demands	**Common Item Formats**	**Recommended Math Practices**
Students will be required to use transformations between two or more circles to show similarity.	• Equation Response • Graphic Response • Multiple Choice Response • Matching Item Response	5
Students will be required to show that the ratios of the circumference to the diameter of any circle are the same.		3, 5
Students will be required to graph the resulting circle from a transformed circle.		5

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-C.A.2 Identify and describe relationships among inscribed angles, radii, and chords.</td></tr>
<tr><td>Explanations</td><td colspan="3">None</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>3, 5</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required to describe the relationship between inscribed angles, radius, and chords of a circle.</td><td rowspan="2">• Equation Response
• Graphic Response
• Multiple Choice Response
• Proposition Response</td><td>3, 5</td></tr>
<tr><td colspan="2">Students will be required to find measures of central, inscribed and circumscribed angles.</td><td>3, 5</td></tr>
</table>

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-C.A.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.</td></tr>
<tr><td>Explanations</td><td colspan="3">None</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>3, 5</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required to construct an inscribed/circumscribed circle of a triangle.</td><td rowspan="3">• Graphic Response
• Hot Text Response
• Multiple Choice Response
• Proposition Response</td><td>5</td></tr>
<tr><td colspan="2">Students will be required to explain the validity of proofs using properties of angles for a quadrilateral inscribed in a circle.</td><td>3, 5</td></tr>
<tr><td colspan="2">Students will be required to complete a two-column proof proving properties of angles for a quadrilateral inscribed in a circle.</td><td>3, 5</td></tr>
</table>

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-C.B.5 Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.</td></tr>
<tr><td>Explanations</td><td colspan="3">None</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.

Emphasize the similarity of all circles. Note that by similarity of sectors with the same central angle, arc lengths are proportional to the radius. Use this as a basis for introducing radian as a unit of measure. It is not intended that it be applied to

Use radian measures for all angles</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>2, 3</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required to understand that sectors with different arcs have arc lengths that are proportional.</td><td rowspan="2">• Equation Response
• Multiple Choice Response</td><td>2, 3</td></tr>
<tr><td colspan="2">Students will be required to understand that sectors with the same arc of two different circles are proportional.</td><td>2, 3</td></tr>
</table>

Congruence

Content Standards	AzCCRS.Math.Content.G-CO.A.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. Item writers should take care that the key does not stand out compared to the distractor options.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	6
Sample Task Demands		**Common Item Formats**	**Recommended Math Practices**
Students will be required to select a definition for a geometric object.		• Multiple Choice Response	6

Content Standards	AzCCRS.Math.Content-G.CO.A.2 Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).		
Explanations	None		
Content Limits	This standard is aligned to Geometry only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	5

Sample Task Demands	**Common Item Formats**	**Recommended Math Practices**
Students will be required to identify a correct transformation given a starting shape and an ending shape.	• Graphic Response • Multiple Choice Response	5
Students will be required to construct a transformation given a starting shape and a sequence of steps.		5
Students will be required to explain the difference between two transformations or a transformation and a stretch in terms of preservation of properties.		5
Students will be required to given a transformation, describe a rule that maps the coordinates of a starting shape to an ending shape.		5

Content Standards	AzCCRS.Math.Content.G-CO.A.3 Given a rectangle, parallelogram, trapezoid, or regular polygons, describe the rotations and reflections that carry it onto itself.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. Shapes should be given on a coordinate grid		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	3, 5

Sample Task Demands	**Common Item Formats**	**Recommended Math Practices**
Students will be required to describe rotations and/or reflections that carry a figure onto itself.	• Multiple Choice Response • Multi-Select Response	3, 5

Content Standards	AzCCRS.Math.Content.G-CO.A.4 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.		
Explanations	Students may observe patterns and develop definitions of rotations, reflections, and translations.		
Content Limits	This standard is aligned to Geometry only. Items should focus on formal definitions of these concepts, i.e. what makes a definition complete or incomplete. Simply recognizing a description of a rotation compared with ones for reflections or rotations is a middle-school skill.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	6, 7
Sample Task Demands		**Common Item Formats**	**Recommended Math Practices**
Students will be required to describe definitions for a given transformation.		• Multiple Choice Response	6, 7

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-CO.A.5 Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.</td></tr>
<tr><td>Explanations</td><td colspan="3">None</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.
Two-dimensional figures</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>3, 5, 7</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required to recognize and identify transformations of a given figure.</td><td rowspan="2">• Graphic Response
• Multiple Choice Response</td><td>5, 7</td></tr>
<tr><td colspan="2">Students will be required to construct a transformation of a figure from given information.</td><td>3, 5, 7</td></tr>
</table>

Content Standards	AzCCRS.Math.Content.G-CO.B.6 Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.		
Explanations	A rigid motion is a transformation of points in space consisting of a sequence of one or more translations, reflections, and/or rotations. Rigid motions are assumed to preserve distances and angle measures.		
Content Limits	This standard is aligned to Geometry only. Two-dimensional figures		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	3, 5, 7

Sample Task Demands	**Common Item Formats**	**Recommended Math Practices**
Students will be required to describe rigid motions involved in a given transformation in terms of size and orientation.	• Multiple Choice Response • Multi-Select Response	5, 7
Students will be required to describe how rigid motions can be used to show congruence.		3, 5, 7

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-CO.B.7 Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.</td></tr>
<tr><td>Explanations</td><td colspan="3">A rigid motion is a transformation of points in space consisting of a sequence of one or more translations, reflections, and/or rotations. Rigid motions are assumed to preserve distances and angle measures.

Two triangles are said to be congruent if one can be exactly superimposed on the other by a rigid motion, and the congruence theorems specify the conditions under which this can occur.</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>3</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required to show/explain that if two triangles are congruent, their corresponding sides and angles are congruent.</td><td rowspan="2">• Graphic Response
• Multiple Choice Response</td><td>3</td></tr>
<tr><td colspan="2">Students will be required to show/explain that if two triangles' corresponding sides and angles are congruent, then the figures are congruent.</td><td>3</td></tr>
</table>

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-CO.B.8 Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.</td></tr>
<tr><td>Explanations</td><td colspan="3">None</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>3</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required to explain how, given that rigid motions preserve congruence, the criteria ASA, SAS, and/or SSS are true.</td><td>• Hot Text Response
• Multiple Choice Response
• Proposition Response</td><td>3</td></tr>
</table>

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-CO.C.9 Prove theorems about lines and angles.</td></tr>
<tr><td>Explanations</td><td colspan="3">None</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.
Theorems are not limited to only those in the “include” list, however they must be about lines and angles.</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>3, 5</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required to eomplete a proof.</td><td>• Hot Text Response
• Multiple Choice Response
• Proposition Response</td><td>3, 5</td></tr>
</table>

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-CO.C.10 Prove theorems about triangles.</td></tr>
<tr><td>Explanations</td><td colspan="3">None</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.
Theorems are not limited to only those in the “include” list, however they must be about triangles</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>3, 5</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required to eomplete a proof.</td><td>• Hot Text Response
• Multiple Choice Response
• Proposition Response</td><td>3, 5</td></tr>
</table>

Content Standards	AzCCRS.Math.Content.G-CO.C.11 Prove theorems about parallelograms.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. Theorems are not limited to only those in the "include" list, however they must be about parallelograms		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	3, 5
Sample Task Demands		**Common Item Formats**	**Recommended Math Practices**
Students will be required to eomplete a proof.		• Hot Text Response • Multiple Choice Response • Proposition Response	3, 5

Content Standards	AzCCRS.Math.Content.G-CO.D.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).		
Explanations	None		
Content Limits	This standard is aligned to Geometry only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	5, 6

Sample Task Demands	Common Item Formats	Recommended Math Practices
Students will be required to draw a shape within a construction framework (item must require or at least refer student to use common construction techniques).	• Graphic Response • Hot Text Response • Multiple Choice Response	5, 6

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-CO.D.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.</td></tr>
<tr><td>Explanations</td><td colspan="3">None</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>5, 6</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required to construct a figure or show the vertices of the figure inscribed in a circle.</td><td rowspan="2">• Graphic Response
• Multiple Choice Response</td><td>5, 6</td></tr>
<tr><td colspan="2">Students will be required to explain the reason(s) points on a circle are vertices of a figure.</td><td>5, 6</td></tr>
</table>

Geometric Measurement and Dimensions

Content Standards	AzCCRS.Math.Content.G-GMD.A.1 Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone.		
Explanations	Cavalieri's principle is if two solids have the same height and the same cross-sectional area at every level, then they have the same volume.		
Content Limits	This standard is aligned to Geometry only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	3, 4, 5
Sample Task Demands		**Common Item Formats**	**Recommended Math Practices**
Students will be required to complete an informal argument.		• Hot Text Response • Multiple Choice Response • Proposition Response	3, 4, 5

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.</td></tr>
<tr><td>Explanations</td><td colspan="3">Missing measures can include but are not limited to slant height, altitude, height, diagonal of a prism, edge length, and radius.</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.
Focus should be on solving problems, not simply finding the volume of given figures.</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>1, 2</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required to solve problems based on the volume of cylinders, pyramids, cones, or spheres.</td><td rowspan="2">• Equation Response</td><td>1, 2</td></tr>
<tr><td colspan="2">Students will be required to solve problems based on the volumes of compositions or parts of cylinders, pyramids, cones, or spheres.</td><td>1, 2</td></tr>
</table>

Content Standards	AzCCRS.Math.Content.G-GMD.B.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. The focus for the first part of the standard should be on diagonal (not horizontal or vertical) cross-sections.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	4, 5

Sample Task Demands	**Common Item Formats**	**Recommended Math Practices**
Students will be required to identify cross-sections of three-dimensional objects to two-dimensional shapes.	• Multiple Choice Response • Matching Item Response	4, 5
Students will be required to identify the three-dimensional object generated by a rotation of a given two-dimensional object.		4, 5

Expressing Geometric Properties with Equations

Content Standards	AzCCRS.Math.Content.G-GPE.A.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. All four quadrants of the coordinate plane, whole number coordinates, and a perfect square radius.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	7, 8

Sample Task Demands	**Common Item Formats**	**Recommended Math Practices**
Students will be required to construct an equation of a circle given information about the center and radius.	• Equation Response • Multiple Choice Response	7, 8
Students will be required to find the center and/or radius of a circle given an equation not in standard form.		7, 8

Content Standards	AzCCRS.Math.Content.G-GPE.A.2 Derive the equation of a parabola given a focus and directrix.		
Explanations	None		
Content Limits	This standard is aligned to Algebra II only. The directrix should be parallel to a coordinate axis.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	7, 8

Sample Task Demands	**Common Item Formats**	**Recommended Math Practices**
Students will be required to construct an equation of a parabola given its focus and directrix.	• Equation Response	7, 8

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-GPE.B.4 Use coordinates to prove simple geometric theorems algebraically.</td></tr>
<tr><td>Explanations</td><td colspan="3">None</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.
All four quadrants, may use radical values</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>3</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required to rearrange statements to form a proof.</td><td>• Equation Response
• Hot Text Response
• Multiple Choice Response</td><td>3</td></tr>
</table>

Content Standards	AzCCRS.Math.Content.G-GPE.B.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).		
Explanations	Lines can be horizontal, vertical, or neither.		
Content Limits	This standard is aligned to Geometry only. All four quadrants of the coordinate plane; coordinates are restricted to whole numbers.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	3, 8

Sample Task Demands	**Common Item Formats**	**Recommended Math Practices**
Students will be required to construct an equation of a line parallel or perpendicular to another line and containing a specific point.	• Equation Response • Multiple Choice Response • Proposition Response	8
Students will be required to solve a problem using slope criteria for parallel and perpendicular lines.		8
Students will be required to describe aspects of why parallel lines have the same slope and why perpendicular lines have slopes that are negative reciprocals.		3, 8

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-GPE.B.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio.</td></tr>
<tr><td>Explanations</td><td colspan="3">None</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.
Rational numbers</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>2, 8</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required to identify the ratio a point divides a line segment into.</td><td rowspan="2">• Equation Response
• Multiple Choice Response</td><td>2, 8</td></tr>
<tr><td colspan="2">Students will be required to identify points on a line segment that partition it based on a given ratio.</td><td>2, 8</td></tr>
</table>

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-GPE.B.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.</td></tr>
<tr><td>Explanations</td><td colspan="3">None</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.
At least part of the computation must require the distance formula.
Coordinates of all points must be given.</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>2, 3, 6</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required to identify the perimeter of a polygon.</td><td rowspan="2">• Equation Response</td><td>2, 6</td></tr>
<tr><td colspan="2">Students will be required to identify the area of a triangle or rectangle.</td><td>2, 3, 6</td></tr>
</table>

Modeling with Geometry

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).</td></tr>
<tr><td>Explanations</td><td colspan="3">None</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>4, 5, 7</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required to explain how a real-life object can be modeled by three-dimensional geometric objects.</td><td rowspan="2">• Equation Response
• Multiple Choice Response</td><td>4, 5, 7</td></tr>
<tr><td colspan="2">Students will be required to construct an equation that models an object and can be used to find its unknown measure (i.e., the object’s volume, area).</td><td>4, 5, 7</td></tr>
</table>

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-MG.A.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).</td></tr>
<tr><td>Explanations</td><td colspan="3">None</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.
Only some of these items should deal with density of an object, etc. Others should deal with broader applications of the word density, like wolves per square mile.</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>4, 5, 7</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required to calculate a density.</td><td rowspan="2">• Equation Response
• Multiple Choice Response</td><td>5, 7</td></tr>
<tr><td colspan="2">Students will be required to draw conclusions based on a density.</td><td>4, 5, 7</td></tr>
</table>

Content Standards	AzCCRS.Math.Content.G-MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).		
Explanations	None		
Content Limits	This standard is aligned to Geometry only.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is required.	**Math Practices**	1, 4, 5
Sample Task Demands		**Common Item Formats**	**Recommended Math Practices**
Students will be required to satisfy a constraint given parameters in a geometric context.		• Equation Response	1, 4, 5

Similarity, Right Triangles, and Trigonometry

Content Standards	AzCCRS.Math.Content.G-SRT.A.1 Verify experimentally the properties of dilations given by a center and a scale factor: AzCCRS.Math.Content.G-SRT.A.1a Dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.		
Explanations	Dilation is a transformation that moves each point along the ray through the point emanating from a fixed center, and multiplies distances from the center by a common scale factor. Students may observe patterns and verify experimentally the properties of dilations.		
Content Limits	This standard is aligned to Geometry only. Limited to polygons with an emphasis on line segments and right triangles Items should include centers of dilation on a line segment, and not just in the middle of a figure		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	2, 5

Sample Task Demands	**Common Item Formats**	**Recommended Math Practices**
Students will be required to identify the slope of a given side of a dilation, based on the slope of the corresponding side of the original figure.	• Equation Response • Graphic Response • Multiple Choice Response	2, 5
Students will be required to understand a given scale factor and construct a dilation.		2, 5
Students will be required to describe and relate properties of dilations.		2, 5

Content Standards	AzCCRS.Math.Content.G-SRT.A.1 Verify experimentally the properties of dilations given by a center and a scale factor: AzCCRS.Math.Content.G-SRT.A.1b The dilation of a line segment is longer or shorter in the ratio given by the scale factor.		
Explanations	Dilation is a transformation that moves each point along the ray through the point emanating from a fixed center, and multiplies distances from the center by a common scale factor. Students may observe patterns and verify experimentally the properties of dilations.		
Content Limits	This standard is aligned to Geometry only. Limit figures to points, triangles, or rectangles		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	2, 5

Sample Task Demands	**Common Item Formats**	**Recommended Math Practices**
Students will be required to find the length of one side of a dilated figure, given the original figure and a scale factor.	• Equation Response • Multiple Choice Response	2, 5
Students will be required to describe how a scale factor relates to side lengths, and use this relationship to solve problems.		2, 5

Content Standards	AzCCRS.Math.Content.G-SRT.A.2 Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.		
Explanations	A similarity transformation is a rigid motion followed by dilation.		
Content Limits	This standard is aligned to Geometry only. Figures should be given on a coordinate plane Items for task demand 3 should assess knowledge of this line of reasoning - "Two shapes are similar if one can be obtained using reflections, rotations, translations, and/or dilations on the other. All of these transformations maintain angle measure and ratios of side lengths. Therefore, similar figures have equal corresponding angle measures and corresponding pairs of sides are proportional."		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	3, 5, 7

Sample Task Demands	**Common Item Formats**	**Recommended Math Practices**
Students will be required to identify similar figures.	• Equation Response • Multiple Choice Response	5, 7
Students will be required to identify a transformation or series of transformations, including dilations (including scale factors of dilations), that show that two figures are similar.		5, 7
Students will be required to describe the connection between similarity and transformations.		3, 5, 7

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-SRT.A.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.</td></tr>
<tr><td>Explanations</td><td colspan="3">None</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>3</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required toidentify similar triangles based on AA.</td><td rowspan="2">• Multiple Choice Response</td><td>3</td></tr>
<tr><td colspan="2">Students will be required to informally describe why the AA criterion is true.</td><td>3</td></tr>
</table>

Content Standards	AzCCRS.Math.Content.G-SRT.B.4 Prove theorems about triangles.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. Theorems about triangles are restricted to the following: Prove that a line constructed parallel to one side of a triangle intersecting the other two sides of the triangle divides the intersected side proportionally. Prove that a line that divides two sides of a triangle proportionally is parallel to the third side. Prove that if three sides of one triangle are proportional to the corresponding sides of another triangle, the triangles are similar. Prove the Pythagorean Theorem using similarity.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	3, 5
Sample Task Demands		**Common Item Formats**	**Recommended Math Practices**
Students will be required to complete a proof.		• Hot Text Response • Multiple Choice Response • Proposition Response	3, 5

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-SRT.B.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.</td></tr>
<tr><td>Explanations</td><td colspan="3">Similarity postulates include SSS, SAS, and AA.
Congruence postulates include SSS, SAS, ASA, AAS, and H-L.</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.
Items use SSS, SAS, ASA, and/or AAS for congruence
Items use AA, SAS (ratios) and/or SSS (ratios) for similarity</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>3, 5</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required to solve a problem that uses congruence and/or similarity criteria.</td><td rowspan="2">• Equation Response
• Hot Text Response
• Multiple Choice Response</td><td>5</td></tr>
<tr><td colspan="2">Students will be required to construct, analyze, and/or critique a proof that uses congruence and/or similarity criteria to shows a relationship between two figures.</td><td>3, 5</td></tr>
</table>

Content Standards	AzCCRS.Math.Content.G-SRT.C.6 Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. The trigonometric ratios are limited to sine, cosine, and tangent.		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	6, 8

Sample Task Demands	**Common Item Formats**	**Recommended Math Practices**
Students will be required to define the trigonometric ratios: sine, cosine, and tangent.	• Equation Response • Multiple Choice Response • Matching Item Response	8
Students will be required to identify the sine, cosine, and/or tangent ratio of a given triangle.		6, 8
Students will be required to use the trigonometric ratios to find the length of an unknown side.		6, 8

<table>
<tr><td>Content Standards</td><td colspan="3">AzCCRS.Math.Content.G-SRT.C.7 Explain and use the relationship between the sine and cosine of complementary angles.</td></tr>
<tr><td>Explanations</td><td colspan="3">None</td></tr>
<tr><td>Content Limits</td><td colspan="3">This standard is aligned to Geometry only.</td></tr>
<tr><td>Common Item Formats</td><td colspan="3">The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.</td></tr>
<tr><td>Context</td><td>Context is allowed.</td><td>Math Practices</td><td>3</td></tr>
<tr><td colspan="2">Sample Task Demands</td><td>Common Item Formats</td><td>Recommended Math Practices</td></tr>
<tr><td colspan="2">Students will be required to identify the relationship between the sine and cosine of acute angles in a right triangle: the sine of an angle is equal to the cosine of its complement and vice versa.</td><td rowspan="2">• Equation Response
• Multiple Choice Response</td><td>3</td></tr>
<tr><td colspan="2">Students will be required to use the sine and cosine functions to find the measure of an unknown angle given the measure of its complementary angle.</td><td>3</td></tr>
</table>

Content Standards	AzCCRS.Math.Content.G-SRT.C.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.		
Explanations	None		
Content Limits	This standard is aligned to Geometry only. Items at this standard must require the student to solve real-life problems (e.g., use Pythagorean to find distance traveled on a map), and not simply find side lengths or angles of given triangles		
Common Item Formats	The Item Formats section on pages 11 through 13 provides a list of item formats that may be used to assess this standard. The common item formats include but are not limited to those shown with the sample task demands.		
Context	Context is allowed.	**Math Practices**	1, 4, 5
Sample Task Demands		**Common Item Formats**	**Recommended Math Practices**
Students will be required to use the Pythagorean Theorem and/or trigonometric ratios to solve problems involving right triangles.		• Equation Response • Graphic Response	1, 4, 5